

Looking to Improve Your Practice? Consider the Science of Quality Improvement to Get Started

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Quality improvement in health care is the responsibility of everyone (eg, patients, families, health providers, and administrative staff) to work toward delivering high-quality patient care, advancing professional knowledge and skills, and creating effective and efficient processes of care. Those involved in athletic health care, similar to other health care professionals, should strive to create patient care experiences that are safe, timely, effective, efficient, equitable, and patient centered. Exploring the differences between quality improvement and research will help define the focus of improvement sciences on the health of systems, which is to identify quality gaps and evaluate processes of care, as opposed to filling knowledge

gaps. Furthermore, considering the principles of quality improvement will set the foundation for quality initiatives in health care to focus on patients, value teams, emphasize systems and processes of care, appreciate variability, and require data. With a greater understanding of the principles of the quality improvement sciences, athletic trainers will be better positioned to create a culture of quality improvement and to take the initiative in leading improvement efforts so that local systems support the delivery of high-quality patient care.

Key Words: model for improvement, systems analysis, fishbone diagrams, outcome and process assessment

Key Points

- Clinicians have the responsibility of improving their systems by focusing on quality for the purpose of promoting the delivery of high-quality health care for patients.
- The Model for Improvement can be used to identify a concern about quality and plan for improvement in a systematic way.
- Guiding principles, such as understanding systems and processes of care, appreciating the power of variability, and using data to drive change, can support the development of successful quality improvement initiatives.

Quality improvement has been a part of health care since the 1800s, with the goal of collecting and analyzing information about health systems in order to make meaningful changes to clinical practice.^{1–3} More recently, the Institute of Medicine, in its report *Crossing the Quality Chasm: A New Health System for the 21st Century*,⁴ highlighted the need to create a health care system that closes the gap between the health care that people receive and the known availability of good-quality health care. Six criteria—safe, timely, effective, efficient, equitable, and patient centered (also known as STEEEP)—were introduced to guide the redesign of health care toward quality improvement and meeting these quality characteristics.⁴ Motivating factors that sustain the interest in quality improvement are numerous, but 2 persistently troubling concerns are the estimated 250 000 medical errors that occur annually,⁵ constituting the third largest cause of death in the United States, and the perpetual rise in health care costs that is insurmountable for many patients. Although athletic health care may not often involve high-risk situations that affect the broader health care community, numerous areas for quality improvement exist, and striving to be a health profession that delivers care according to the STEEEP criteria should be a goal of all

athletic trainers.⁶ Quality improvement describes the health of systems and processes of care that can be optimized through diagnosis and treatment, similar to caring for patients.⁷ The purpose of this commentary was to provide information about the design of quality improvement projects to promote the development of quality improvement initiatives in local health care systems. With a greater understanding of the principles of quality improvement science, athletic trainers will be positioned to create a culture of quality improvement and lead improvement initiatives in local systems to support the delivery of high-quality patient care.

Quality improvement is defined as the work of all stakeholders, including patients, families, administrative support, and health care providers, to promote better patient outcomes, system performance, and professional development.⁸ The interaction of these pillars highlights how this shared responsibility is important for improving the health of individuals, enhancing the care experience, and promoting learning among health care professionals.^{7,8} Gaps in care are often evident in health systems and can drive quality initiatives. As such, methods of identifying improvement areas include reflecting on practice and working to identify gaps between what we know to do

(eg, implement evidence-based lower extremity injury-prevention programs) and what we actually do (eg, oversee preactivity warm-ups that do not follow evidence-based recommendations). As does research, quality improvement uses methods, such as the Model for Improvement,^{6,7,9–11} and guiding principles to find solutions to gaps in quality. However, quality improvement is different than research.^{9,12–14} Factors such as intent, design and methods, and benefit are some of the characteristics that distinguish between quality improvement and research.

DISTINGUISHING QUALITY IMPROVEMENT FROM RESEARCH

Historically, one of the distinguishing characteristics between quality improvement and research was publication: quality improvement was perceived as not publishable and research as publishable.^{13,14} Yet publication is no longer a differentiating factor.¹³ Although quality improvement efforts are disseminated less frequently than research, both are publishable.¹⁵ Furthermore, the *Journal of Athletic Training* launched a quality improvement peer-reviewed manuscript format to help disseminate work related to improvement science, and other journals, including the *BMJ Open Quality*, *American Journal of Medical Quality*, and *Joint Commission Journal on Quality and Patient Safety*, also support this design.

A distinguishing characteristic between quality improvement and research is the intent of the work.^{12–14} The intent of quality improvement is to address a specific quality gap in a local health care system and to make that system better, not to be an independent producer of new knowledge.^{12,13} In contrast, the intent of research is to fill a knowledge gap by producing new or advancing knowledge and generalizing the results to broader populations.^{9,13,14,16} For example, a quality improvement initiative would focus on designing a strategy to increase handwashing among clinicians after patient interactions in a local system, whereas research would identify the best method of handwashing to reduce transmission of bacteria with the intent of sharing the better technique with all practicing clinicians.

Design characteristics and rigor of quality improvement and research also differ. The quality improvement sciences use frameworks to design projects such as Lean, Six Sigma, rapid cycle improvement, and the Model for Improvement.^{10,11,17} The Model for Improvement (Figure 1) has been promoted in health care⁷ disciplines and was introduced to athletic health care several years ago.⁶ The Model for Improvement consists of 3 driving questions and a plan-do-study-act cycle.^{6,7,17} The 3 questions are important in narrowing the goal of the initiative, exploring measures (data) to determine when an improvement has occurred, and identifying specific changes (ie, tests of change) that may lead to improvement. Conversely, research is based on the scientific method.

Models for quality improvement and research have different design characteristics. For example, quality improvement methods are more fluid, more adaptive, and less controlled; research is more systematic and rigid, is usually designed to remove biases, and follows specific protocols that remain consistent throughout the study period.^{13,14} Appropriate types of statistical analyses may also differ between these approaches. Because quality

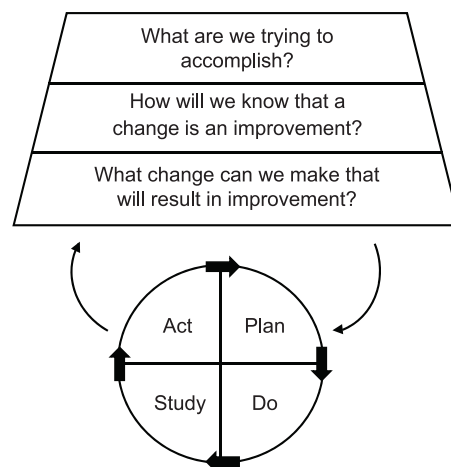


Figure 1. The Model for Improvement. Reprinted with permission. Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. 2nd ed. San Francisco, CA: Jossey-Bass. Copyright 2009; 23–24. All rights reserved.^{4,17}

improvement initiatives often consider system processes and outcomes over time, the use of statistical process control charts,^{7,18,19} such as run charts and control charts, is preferred for data presentation.^{7,19} Furthermore, plotting data on charts allows trends in data to be assessed over time using repeated measures for a better interpretation of system functioning. Inferential statistics, such as *t* tests and analyses of variance, are used less commonly in quality improvement, especially when evaluating the functioning of processes. Because the design of quality improvement does not follow traditional hypothesis testing or comparison of group differences in research studies, pre-post designs may not be the best approach to analyzing the data.^{7,19} Health Quality Ontario provided an informative example of the appropriateness of statistical process control charts in quality improvement efforts,¹⁹ and the Institute for Healthcare Improvement²⁰ developed a toolkit to support the development of run and control charts.

Another difference between quality improvement and research is the intended benefit. Quality improvement initiatives are meant to directly benefit local systems, and patients are likely to receive that benefit, often immediately.^{12,13} Conversely, participants in research studies are unlikely to receive an immediate benefit from study involvement and may never directly benefit from it. The rapid feedback and benefit to patients in a local setting is a distinguishing feature of quality improvement.¹² Overall, these features help to differentiate the scope and intent between quality improvement and research. However, design strategies may overlap between the 2 approaches, blurring the lines between them.¹²

CONSIDERATIONS FOR DESIGNING QUALITY IMPROVEMENT PROJECTS

Quality improvement projects are typically small-scale attempts to address a frustration, narrow a quality gap, eliminate a safety concern, or correct a problem within a local system. Simple, small-scale efforts are more likely to result in success than bigger initiatives. Change can be generated via numerous simple ideas, such as improving

the patient experience in a hospital setting for those with a shoulder dislocation,²¹ reducing errors associated with radiographs in pediatric sports medicine,²² and increasing the delivery of return-to-drive recommendations for patients after concussion.²³ In these examples, strategies (ie, tests of change) for improvement may include disseminating or posting flyers, education and training, system improvements (eg, prompts in electronic medical records), process simplification, team huddles, and feedback. Whatever the idea for improvement, guiding principles help us to better understand the framework of quality improvement projects and initiatives. Namely, quality improvement projects (1) focus on patients, (2) value teams, (3) emphasize systems and processes of care, (4) appreciate the power of variability, and (5) require data.²⁴ Each principle provides insight into the conceptualization and development of quality improvement initiatives.

Focus on Patients and Value Teams

When creating a quality improvement initiative, the focus should be on the patient, and an improvement team should be in place.²⁴ As the definition of quality improvement⁸ and the STEEP criteria⁴ suggest, enhancing both the patient experience and patient care is at the core of quality improvement. Furthermore, because quality improvement involves everyone,⁸ teams are essential for driving these initiatives.^{11,18,24} A successful quality improvement project is characterized by the identification of a day-to-day leader who champions the cause,²⁵ inclusion of technical experts who understand different components of the system and processes, and securing of an executive sponsor who has the access and authority to obtain resources.^{7,25} The importance of engaging teams to support a quality improvement effort cannot be understated.

Emphasize Systems and Processes of Care

Quality improvement initiatives focus on the health of systems and, much like patient care, are about the health of patients; this focus is important when conceptualizing a project. Systems of care can be as small as the interaction of a patient and clinician or include athletic training facilities and the school nurse or extend to student health services and the university hospital. Systems are made up of numerous processes; unhealthy systems are ripe for improvement efforts. For example, coordinating care between athletic training facilities may involve delays due to communication, different processes for scheduling appointments, variability in documentation practices, or other process concerns that impede the care experience. Because systems are complex, efforts to understand the inputs (eg, people, infrastructure, and materials), processes (eg, what is done and how), and outcomes (eg, end result of care) are critical.²⁶ Although quality improvement efforts can focus on any aspect of a system, processes are often targeted when building a culture of improvement in a system. Because processes focus on what is being done in a system and how it is accomplished,²⁶ improvements can target reducing waste, eliminating steps, minimizing handoffs, and streamlining the workflow or addressing any other factors that affect how a task is performed.¹⁷ Focusing on the health of systems requires a system

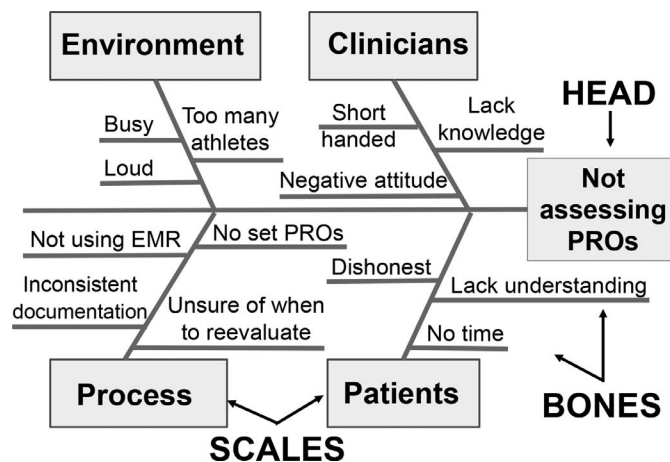


Figure 2. Example of a fishbone diagram. Abbreviations: EMR, electronic medical record; PROs, patient-reported outcomes.

diagnosis and becoming what quality improvement science terms *process literate*. Therefore, understanding system processes is necessary when considering improvement strategies because “every system is perfectly designed to get the results it gets.”⁷

Understanding the elements of a process in detail, specifically what is done and how, presents opportunities for change and, we hope, improvement. Existing tools for becoming process literate include brainstorming, process maps (also called flow charts), fishbone diagrams (also called Ishikawa or cause-and-effect diagrams), 5 Whys techniques, Pareto charts, and driver diagrams. At a minimum, a process map^{7,18} and fishbone diagram^{7,18} are recommended. Process maps identify the current process and highlight impediments, such as redundancies, opportunities for error, waste, and flow concerns. As such, understanding the process in its current form is necessary to visualize problems and identify areas in need of improvement.

The fishbone diagram (Figure 2) is another helpful tool that clarifies the elements of the quality improvement initiative and allows the factors contributing to the quality concern to be visualized. A fishbone diagram consists of the following elements:

- Head: the quality problem or gap
- Scales: broad system components (eg, people, policy, material, and methods)
- Bones: specific contributing factors to the quality problem or gap

When constructing a fishbone diagram, the general rule is that the head and bones of the fish must follow the same direction, either positive or negative. For example, if the head of the fish indicates “lengthy wait times in the athletic training facility,” then the bones of the fish must be factors that contribute to lengthy wait times, such as no set appointment schedule, uneven patient flow in the athletic training facility, and an inefficient patient check-in process. Thus, a fishbone diagram provides insight into all possible factors contributing to a quality concern. From this list, the quality improvement team generates ideas for change, which are often referred to as *tests of change* in improvement science. Obviously, it would be impossible

to address all contributing factors in a single quality improvement project, so the team must carefully select ideas that either have the potential for meaningful improvement or are the most feasible to implement.

Appreciate the Power of Variability

A necessary element of understanding a system is appreciating the power of its variability.²⁴ Because variability exists in all systems,⁷ the focus should be on common cause and special cause variations.¹⁹ *Common cause variation* is expected, affects everyone, and is part of the system. As such, it is stable and predictable.¹⁹ *Special cause variation* is unexpected, does not affect everyone, and is not part of the normal system. Thus, its characteristics are instability and unpredictability.⁷

As an example of this guiding principle, consider the multistep pregame processes involved in hosting a basketball game. A component of this process is the emergency action plan time out; the process sets the time out for approximately 30 minutes before the game, but the actual time out occurs 25 to 35 minutes before the game. This normal fluctuation in time is a common cause variation. However, when a key member of the athletic staff arrives late to the basketball game because of bad weather and the time out does not occur until minutes before the game, the delay is a special cause variation: a disruption in the process by a factor outside the system. As suggested by this example, understanding the type of variation is important because the solution will be different based on the variability. Removing a special cause variation resets the system to normal and is unlikely to result in a change other than addressing of the factor that prompted the instability.¹⁹ Addressing a common cause variation in a system requires a change to the system.¹⁹ Without change, processes remain the same, with predictable amounts of variability. Even though this scenario depicts special cause variation in a negative light, common and special cause variations are neither good nor bad.¹⁹ If a system is experiencing a common cause variation and there is reason to believe improvement is possible, then the only chance for improvement is through a change to the system. If a special cause variation is producing a positive effect, efforts should target capturing that effect and incorporating it in the system (ie, making it a common cause variation).¹⁹ Naturally, a special cause variation that negatively affects a system must be removed to reset the system to normal.¹⁹ To understand system variations, though, data are necessary.

Require Data

Data allow for the assessment of a system's current status, provide the opportunity to evaluate the effects of change within the system, and demonstrate success when positive improvements are realized.^{7,24} Quality improvement is not possible without data. Baseline data are important when becoming process literate because they allow for a correct interpretation of system functioning. Although the thought of collecting data can be overwhelming, the data needed for quality improvement are easy to collect. For instance, when considering process improvements, data may indicate whether the process was conducted according to plan; a simple check of *yes* (it was done) or *no* (it was not done) could measure this

outcome. These kinds of data, known as frequencies or counts, can be measured over time and plotted in statistical process control charts; variability in the system can also be assessed. Moreover, once a test of change is implemented, these data can be evaluated via charting or other analyses.

GETTING STARTED WITH HEALTH CARE QUALITY IMPROVEMENT

This commentary is a call for athletic trainers to appreciate the differences between quality improvement and research, absorb the principles of quality improvement science, reflect on the health of their local systems and processes of care, and create a culture of quality improvement within local systems and athletic health care overall. These efforts will promote quality improvement projects that deliver high-quality health care that fulfills the STEEP criteria. They may also initiate a quality improvement project by bringing a team together to reflect on the health care system and identify a single process that could be improved. For example, current processes may cause long patient wait times, and efforts to reduce the wait would result in more timely delivery of care. Or, perhaps, current communication processes for postinjury treatment among patients, parents, and clinicians are inefficient and could be improved for a better patient experience. A typical patient evaluation may include inconsistent use of clinical prediction rules to support decisions, and better consistency would make triage more efficient and improve patient safety. These areas can be explored with a quality improvement focus. Additional information regarding the value and design of a quality improvement project is available in an article by Lopes Sauers et al.⁶

Once an improvement project is complete, consider sharing the experience by submitting a manuscript to the *Journal of Athletic Training*. The journal will use the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines for quality improvement manuscripts.¹⁵ Elements of the SQUIRE guidelines¹⁵ are similar to those of traditional manuscripts. Specifically, authors are asked to identify the following content related to the quality improvement project: background (ie, relevant scientific literature) and local problem (ie, a quality gap in the system), measurement (ie, the data used to determine whether a change is an improvement), design (ie, the intervention or small test of change), strategy (ie, the quality improvement methods, such as the Model for Improvement), results (eg, the presentation of data, such as via statistical process control charts), lessons and limitations (eg, the successes and challenges associated with the improvement effort), and conclusions (ie, the take-home points for personnel in other systems to consider). Athletic trainers are encouraged to improve their systems of health care delivery by focusing on quality—our responsibility as health care providers. Remember, start small, identify an area of improvement, and get started. Quality improvement is a necessary component in order to deliver the highest standard of care.

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